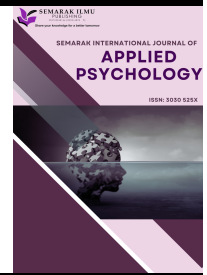




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Autism Spectrum Disorder in Malaysia: A Systematic Review of Safety Risks, Caregiver Health, and Intervention Gaps

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ABSTRACT

Autism Spectrum Disorder (ASD) presents multifaceted safety and health challenges that extend beyond clinical symptoms to include behavioural risks, caregiver burden, and systemic service gaps. In Malaysia, caregivers frequently assume the role of primary safety managers for individuals with ASD, often in the absence of structured and accessible support systems. However, existing empirical evidence addressing autism-related safety and health issues remains fragmented across disciplines. This systematic literature review synthesised empirical studies conducted in Malaysia and published between 2019 and 2024. Guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework, searches were conducted in Scopus, Web of Science, ScienceDirect, and Google Scholar. Thirteen eligible studies were included following screening and quality appraisal using the Effective Public Health Practice Project (EPHPP) tool. Results: The synthesis identified three interrelated domains of concern: (i) behavioural and environmental safety risks among individuals with ASD, including meltdowns, sensory overload, and wandering; (ii) substantial psychological and occupational health burden experienced by caregivers, characterised by chronic stress, anxiety, and reduced quality of life; and (iii) systemic intervention gaps related to limited service accessibility, inconsistent implementation, and shortages of trained professionals. While behavioural and community-based interventions demonstrated potential benefits, their effectiveness was frequently constrained by structural and resource-related limitations. Autism-related safety and health challenges in Malaysia reflect a complex interaction between individual behavioural risks, caregiver well-being, and healthcare system constraints. Strengthening autism care requires coordinated, contextually appropriate strategies that integrate caregiver training, standardised intervention delivery, and equitable service access. These findings provide evidence to inform healthcare providers and policymakers seeking to improve autism-related safety and health outcomes within the Malaysian public health landscape.

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1. Introduction

Autism Spectrum Disorder ASD is a neurodevelopmental disorder marked by impaired social interactions, verbal and nonverbal communication deficits, and restricted, repetitive behaviour patterns. On a global scale, the incidence of ASD has been consistently rising. Based on the publication by World Health Organization in November 2023, prevalence of ASD is now around 1 in 100 children. In Malaysia, based on the unpublished data from Ministry of Health in 2005, one in every 625 children has ASD. The increasing occurrence of this condition has drawn attention to the substantial health and safety difficulties experienced by individuals with ASD and those responsible for their care. Providing care for children with ASD involves distinct difficulties that go beyond the usual duties of a caregiver. Caregivers frequently encounter substantial psychological strain, financial hardships, and social seclusion while managing their children with ASD [1]. Caregivers must employ specialised care practices to manage the symptoms associated with ASD, including difficulties in communication and behavioural challenges. These challenges can result in feelings of burnout and mental health issues for caregivers.

In Malaysia, the rising occurrence of ASD reflects worldwide patterns, as there is a growing acknowledgement of the necessity for extensive support networks for individuals with ASD and their caregivers. However, the specific circumstances in Malaysia provide distinct difficulties in addressing the safety and health requirements of individuals with ASD. Like many developing countries, Malaysia encounters substantial deficiencies in delivering services for individuals with ASD [2]. The absence of specialized services, especially in rural areas, results in numerous families facing difficulties in obtaining essential assistance for their children. Studies have shown that the lack of early intervention centres and specialized schools, primarily concentrated in metropolitan regions, further exacerbates this condition [3,4]. Consequently, parents frequently undertake extensive journeys to access these services, thereby increasing financial and emotional hardships [5].

To date, no systematic review has synthesised Malaysian empirical evidence through a safety and health lens that simultaneously considers child-related risks, caregiver well-being, and service-level constraints. Addressing this gap is essential for informing healthcare providers, policymakers, and support organisations seeking to improve autism-related services and caregiver support. Therefore, this systematic literature review aims to integrate recent Malaysian studies to elucidate key safety risks, caregiver management strategies, and intervention gaps relevant to autism care within the national public health landscape.

2. Methodology

2.1 Eligibility Criteria

To address the research issues, specific criteria for inclusion and exclusion were devised. These criteria aimed to identify the most common safety and health concerns among ASD community. What is the perception of caregivers regarding these safety and health risks and how do they handle them? Which interventions or methods have demonstrated efficacy in enhancing safety and health outcomes in this population? To maintain the emphasis on original research, only peer-reviewed journal papers with empirical data were chosen, while eliminating review articles, book series, books, book chapters, and conference proceedings. Furthermore, the search was limited to articles written in English to prevent any confusion or difficulties in translation, thereby assuring uniformity in the interpretation of data. The review specifically examined research published between 2019 and 2024 to gather up-to-date information on recent advancements and current practices in ASD safety and

health and the caregiver methods. This approach ensured a thorough awareness of the present situation in this field.

2.2 Search Strategy

This SLR was guided by the PRISMA Statement as illustrated in Fig 1, a widely recognised framework in the field of safety and health research. The utilisation of the PRISMA framework facilitated a thorough and systematic exploration of pertinent literature pertaining to safety and health challenges, caregiver management approaches, and intervention therapies within the autistic community. In this study, four primary academic databases were selected for the search: Scopus, WoS, ScienceDirect, and Google Scholar. The search technique incorporated the following keywords: autism safety; autism safety challenges; autism caregiver stress; autism safety challenges; autism interventions; autism safety protocols; autism therapy; autism activity; and autism in Malaysia. These terms were selected to encompass a wide range of research on safety and health in ASD care, with a particular emphasis on locating empirical studies that align with the objectives of this SLR.

An illustrative instance involves the utilisation of the subsequent search approach within the Scopus database: (autism OR ASD OR autism spectrum disorder AND caregiver challenges OR caregiver stress OR parents challenges OR parents' problem OR safety challenges AND intervention strategies OR intervention therapy OR intervention activities AND Malaysia OR Malaysian).

Initial searches produced 3,561 articles using the specified keywords. Following eliminating duplicates and applying inclusion and exclusion criteria, a total of 851 articles were selected for further evaluation. The screening method entailed a meticulous analysis of titles and abstracts, identifying 46 papers that fulfilled the specified criteria (Fig 1). Subsequently, these papers underwent a comprehensive evaluation, identifying 13 studies considered highly pertinent to the aims of the SLR. During the following stages, important characteristics were determined from the chosen studies. These variables include the most common safety and health concerns, interventions used by caregivers to manage the situation, and the success of different therapies. This meticulous search technique guaranteed that the SLR thoroughly examined the study issues and yielded useful insights into the safety and health challenges

2.3 Quality Assessment

The selected studies in this SLR were evaluated for their quality using the Effective Public Health Practice Project (EPHPP) Quality Assessment Tool for quantitative studies. This tool assesses multiple dimensions of study quality, encompassing factors such as selection bias, study design, confounding variables, blinding, data collection procedures, and attrition rates. The EPHPP tool is supplemented by an elaborate lexicon that guides the evaluation process, guaranteeing uniformity in the assessment of every study. Each study was evaluated based on the previously indicated criteria, leading to an overall grade of high, medium, or low quality. More precisely, studies were classified as high-quality if none of the dimensions were considered weak, moderate quality if one dimension was considered weak, and poor quality if two or more dimensions were considered weak. Subsequently, these scores were combined to evaluate the study's overall quality comprehensively. The quality assessment process was carried out autonomously by all authors participating in the SLR. All conflicts or questions that emerged throughout the assessment were collaboratively addressed and resolved, guaranteeing a consensus on the quality ratings awarded to each study. The stringent quality evaluation method was essential to ensure that the SLR findings were grounded in strong and

dependable evidence. This process enhances the validity and reliability of the conclusions reached from the review.

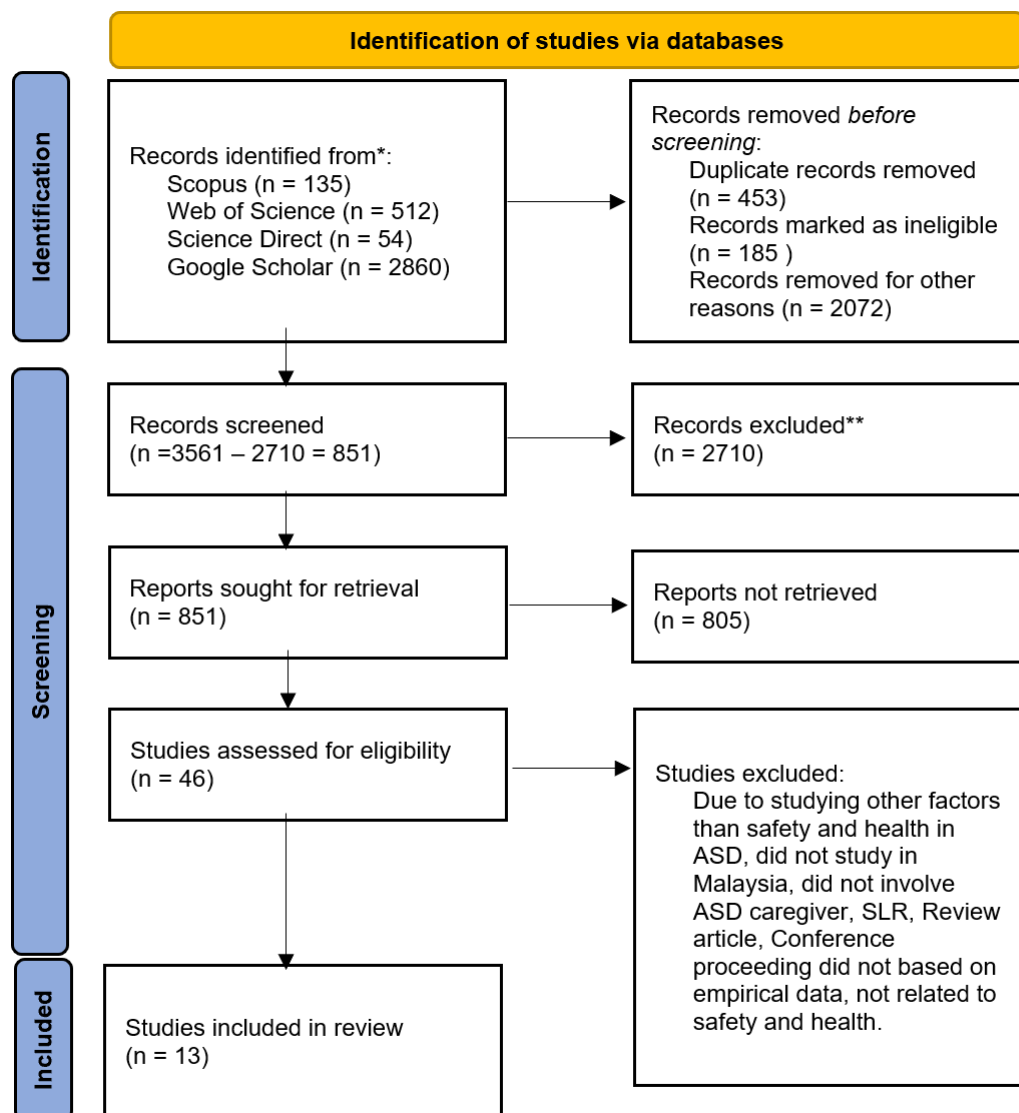


Fig. 1. Literature search strategy and selection for included studies (n = 13)

3. Results

3.1 Study Selection

After conducting a comprehensive examination of the abstracts and complete texts, 13 papers were chosen to be included in this SLR [6-18]. The selection of these studies was based on their direct relevance to the primary goals of this review, which include identifying common safety and health issues faced by individuals with ASD, comprehending how caregivers perceive and address these concerns, and assessing the efficacy of interventions or strategies designed to enhance safety and health outcomes for this population. All the chosen research were carried out in Malaysia, guaranteeing a concentrated examination of domestic obstacles and remedies.

3.2 Study Characteristics

Table 1 presents a thorough overview of the features of the studies that were considered. It focuses on the study participants, the methodologies employed, and the main discoveries pertaining to safety and health issues, caregiver approaches, and the effectiveness of interventions. This specific selection guarantees that the review examines the distinct safety and health difficulties encountered by individuals with ASD and their caregivers in Malaysia.

3.3 Quality Assessment

Table 2 provides a concise overview of the quality of the 13 studies that were chosen. The comprehensive evaluation indicates that a substantial percentage of the studies achieved high scores regarding data collection methods (46%) and selection bias (38%). Nevertheless, persistent deficiencies were observed in participant blinding across the investigations, with most studies (85%) being assigned a weak ranking in this category. The evaluation of variables that could affect the results yielded varied outcomes, with 23% of the studies demonstrating a high level of control, 54% showing a moderate level, and 23% displaying a low level. Regarding the study design, 23% of the studies were classified as strong, 69% as moderate, and 8% as weak. The evaluation of withdrawals and dropouts exhibited variation, with 31% of studies being classified as strong, 62% as moderate, and 8% as weak. In total, 23% of the studies were categorised as high quality, 69% as moderate quality, and 8% as low quality.

3.4 Safety and Health Challenges in the ASD Community in Malaysia

The review of the 13 chosen publications revealed several significant safety and health issues faced by individuals with ASD and their caregivers in Malaysia. More than half of the studies have identified considerable difficulties in regulating behaviours associated with ASD, specifically meltdowns, sensory processing problems, and challenging behaviours. These actions frequently led to elevated stress levels and added responsibilities for caregivers. The studies highlighted the urgent requirement for improved support systems and increased public awareness to lessen the burden on caregivers and boost the quality of care for individuals with ASD.

Five of the research focused on the emotional and psychological strain faced by caregivers, specifically highlighting elevated levels of stress, anxiety, and depression among parents of children with ASD [6,8,12,14,17]. This research identified insufficient social support and healthcare system shortcomings as significant variables contributing to caregiver distress. Six studies highlighted on the difficulties of accessing suitable services and interventions, particularly in rural or underprivileged locations [7,11,12,15-17]. This research revealed notable deficiencies in early intervention services. It emphasised the necessity for more easily attainable, cost-effective, and culturally appropriate support systems to enhance assistance for the ASD community.

Seven of the studies also examined the efficacy of several behavioural and community-based approaches in enhancing outcomes for individuals with ASD [7,9,11,12,15,17,18]. The studies typically concluded that customised interventions, such as well-organized schedules and surroundings designed to accommodate sensory needs, were successful in addressing specific difficulties. Nevertheless, the efficacy of these interventions was frequently compromised by inconsistent execution and a dearth of proficient practitioners, constraining their total influence. In general, the studies repeatedly found that there is a requirement for more extensive and well-coordinated support systems to tackle the complex issues experienced by individuals with ASD and their caregivers. The results indicate that the effectiveness of strategies and interventions is greatly

influenced by the presence of resources, public knowledge, and the overall support services infrastructure in the community.

4. Discussions

2.1 Prevalent Safety and Health Challenges for Individuals with ASD

The examination of the 13 chosen papers (Table 1) unveiled numerous prominent safety and health issues for ASD community in Malaysia. One common topic explored in nine research was the challenge of effectively handling behaviours associated with ASD, specifically meltdowns, sensory processing difficulties, and challenging behaviours [6-9,11,12,16-18]. These behaviours provide immediate safety and health hazards to individuals with ASD and pose considerable challenges for their caregivers. The results align with international research that recognises these behaviours as prevalent safety and health issues within the autism community [19,20]. An example of a significant safety and health risk in Malaysia is the occurrence of meltdowns in public settings. The dearth of public awareness and comprehension exacerbates these circumstances, resulting in possible injury and heightened caregiver concern. This is consistent with research conducted in other areas, emphasising caregivers' pressure while dealing with public meltdowns. This pressure is typically caused by social stigma and a lack of support from the community [21,22]. Nevertheless, this SLR highlight that these issues are exacerbated by cultural considerations, resulting in heightened public scrutiny and increased complexity for caregivers.

Five investigations highlighted sensory sensitivities as a significant concern, often resulting in sensory overload [9,11,12,16,18]. Experiencing excessive sensory stimulation can lead to challenging reactions or social retreats, making it more challenging to ensure safety and health in both domestic and public environments. The results align with global studies that recognise sensory processing difficulties as a notable element that contributes to safety and health hazards for individuals with ASD [23,24]. Nevertheless, the research conducted in Malaysia emphasised the scarcity of sensory-friendly spaces, which is in stark contrast to countries with more developed infrastructure, resources, and policies that cater to the needs of ASD individuals where such accommodations are becoming more prevalent [25,26]. This discrepancy highlights the necessity for increased focus on sensory requirements in Malaysia, specifically in public and educational environments.

Wandering around or running away from a safe environment without permission or supervision, which was observed in four of the studies, presents substantial safety and health hazards [11,16-18], and is a widely recognised concern in the literature [27-29] where wandering is seen as a significant risk that necessitates the implementation of dedicated safety and health mechanisms. The journal articles in this review has found that the absence of secure surroundings and sufficient supervision are factors that contribute to this risk in Malaysia [11,17,18]. Nevertheless, the situation in Malaysia emphasises the necessity for greater consciousness and measures or resources aimed at preventing ASD individuals from wandering [30], especially in rural or disadvantaged regions where caregivers may lack access to specialised instruction or assistance.

In general, the assessment underscores the complex nature of safety and health concerns faced by individuals with ASD in Malaysia, emphasising that these issues are closely connected to the daily experiences of caregivers. The assessment highlights safety and health issues that are consistent with global trends, but it also identifies specific challenges that are unique to the setting. These challenges include the heightened public attention during meltdowns and the absence of sensory-friendly environments. To tackle these safety and health concerns, it is necessary to employ a combination of public education, enhanced environmental adjustments, and specific treatments designed to meet the distinct requirements of the ASD population in Malaysia. These findings establish a solid basis for

future research and policy formulation to improve safety and health outcomes for individuals with ASD and their caregivers in Malaysia.

4.2 Caregivers' Management Strategies

This SLR reveals a range of intervention utilised by caregivers to manage the safety and health issues linked to the care of individuals with ASD. Although frequently successful, these techniques underscore both the ingenuity of caregivers and the substantial deficiencies in institutional support systems. One prevalent approach seen in seven of the research was implementing organised schedules and employing soothing methods to regulate behaviours such as meltdowns, hostility, and sensory overload [6,7,9,11,12,17,18]. This approach is in line with previous research, which emphasises the significance of consistency and predictability in decreasing anxiety and behavioural challenges in individuals with ASD [31,32]. Nevertheless, the ASD caregivers frequently create this intervention independently, with minimal input from healthcare experts. In contrast, research conducted in more advanced countries has shown that caregivers usually undergo more structured training in behaviour management approaches [33]. The dependence on personally devised intervention highlights the urgent requirement for caregiver training programmes in Malaysia that are more easily accessible.

Another commonly stated method was utilising informal support networks, such as family and community organisations, as observed in six research studies [6,7,11,12,14,18]. Caregivers frequently relied on these networks to seek emotional support, respite care, and guidance in handling daily challenges. This finding aligns with worldwide research that emphasises the significance of social support in reducing caregiver stress and enhancing overall well-being [34]. The support networks are typically informal and do not possess the same level of organisation and resources as more formal support systems found in other nations. This highlights a deficiency in the accessibility of official assistance services, which may be resolved by establishing further structured community-based initiatives that offer dependable and continuous support to caregivers. Additionally, ASD caregivers reported engaging in discussions to establish flexible working hours, exploring opportunities to work remotely, or decreasing their work hours to handle their caring responsibilities effectively [17]. These findings align with other international studies that acknowledge the significance of workplace flexibility in mitigating caregiver stress and enhancing work-life equilibrium [35]. Nevertheless, from this review, obtaining such agreements can be challenging, especially in work situations that are more traditional or less innovative as in Malaysia [11,12,14,17]. This poses a substantial obstacle for caregivers who must balance the requirements of their job and caregiving responsibilities without enough institutional assistance.

The research also emphasised the significance of self-care habits among caregivers, which were examined in four investigations. Caregivers employed strategies such as practising mindfulness, engaging in physical activity, and seeking respite care to address their own mental and physical well-being effectively [6,7,12,18]. These practices align with suggestions from international literature, which emphasise caregivers' need to prioritise their well-being to maintain their caregiving role [36]. However, the efficacy of these measures was frequently constrained by time and financial constraints, since numerous caregivers encountered challenges in continuously upholding self-care routines due to the demanding nature of their duties. In summary, the analysis emphasises that caregivers in Malaysia utilise various approaches to address the challenges associated with caring for individuals with ASD. However, these approaches are typically formulated due to the absence of professional assistance and training. In contrast, caregivers usually have access to a broader range of formalised support services and interventions in contexts with more resources. The results indicate

a significant requirement for contextually suitable support structures and training programmes in Malaysia. These would enable caregivers to handle better the safety and health challenges related to ASD.

4.3 Effectiveness of Interventions in Improving Safety and Health

The studies assessed various interventions, including behavioural therapies, community-based programmes, and early intervention services. The effectiveness of these interventions varied. Four research studies examined behavioural therapies, including applied behaviour analysis (ABA), structured teaching approaches, and sensory integration therapy, to address problematic behaviours and enhance safety and health [9,12,15,17]. The results typically confirm the efficacy of these therapies, especially in reducing challenging behaviours and addressing sensory sensitivities. Research investigations that utilised Applied Behaviour Analysis (ABA) have shown a significant reduction in instances of self-injury and violence. These findings align with worldwide research highlighting the effectiveness of ABA in addressing severe behavioural problems in individuals with ASD [37]. Nevertheless, in this review, studies emphasised a crucial obstacle where the effectiveness of these interventions relies greatly on the regular implementation and the presence of skilled practitioners, which are frequently scarce in this country. In contrast to more developed nations, where there is a greater abundance of experienced professionals and resources, resulting in better rates of success in intervention outcomes [39].

Two studies also examined community-based support programmes to equip caregivers with the necessary skills and resources to handle safety and health problems effectively [15,16]. The programmes, which encompassed support groups and workshops, were discovered to be especially advantageous in rural areas where formal services were deficient. The study by Sidique *et al.*, [15] demonstrated that the efficacy of these programmes was frequently constrained by disparities in availability and divergent standards of excellence, indicating a necessity for more uniform and easily available community support programmes throughout Malaysia. The findings are supporting Sharma *et al.*, [38] that emphasized the value of structured support systems. Their study demonstrated that parent-to-parent support groups effectively reduced anxiety and stress among caregivers of children with ASD. This is because, the support groups provided mutual support, psychoeducation, and stress management strategies. Notably, the intervention resulted in statistically significant reductions in parental stress and anxiety, reinforcing the importance of structured community programs. These studies underscore the necessity for a more cohesive approach to caregiver support in Malaysia. While Sidique *et al.* focused on the geographical disparities in service availability, Sharma *et al.* provided evidence of how structured and well-implemented programs can enhance caregiver resilience. This emphasizes the need for scalable, culturally relevant, and quality-assured support mechanisms to ensure consistent outcomes across diverse regions.

Furthermore, one research investigated using sensory-friendly surroundings and resources, such as sensory rooms and adaptive equipment, to alleviate sensory overload and enhance safety [16]. The effectiveness of these interventions in promoting safety and health for individuals with ASD, particularly in addressing sensory sensitivities that may result in behavioural challenges or self-injurious behaviours, was generally seen. This discovery aligns with global research that supports the implementation of sensory-friendly environments to decrease anxiety and improve the safety and health of individuals with ASD [40,41]. Nevertheless, the research highlighted that such environments are scarce in Malaysia, especially in public spaces and schools. This indicates a significant gap that must be filled to fully capitalise on these interventions' advantages. In summary, the studies examined in this SLR suggest that there are interventions that can effectively enhance safety and

health outcomes for individuals with ASD. However, the effectiveness of these interventions is frequently hindered by external factors such as limited access to services, availability of resources, and inconsistent implementation of programmes. The results highlight the necessity of implementing a more organised strategy for ASD care in Malaysia. This should involve prioritising the expansion of skilled professionals' accessibility, standardising community support programmes, and enhancing the availability of early intervention services, especially in areas that lack sufficient resources.

5. Limitation

The review was restricted to studies published in English, potentially excluding relevant literature in other languages, and focused only on papers published between 2019 and 2024, which may overlook earlier foundational studies. Additionally, most of the analyzed studies were of moderate quality, limiting the robustness of the findings. Variations in the implementation and evaluation of interventions across studies further complicate generalization of results. While the focus on the Malaysian context offers important cultural and regional insights, it limits the applicability of findings to other settings with different social, cultural, and healthcare landscapes. Despite these limitations, this review serves as a crucial foundation for future research and policy development to improve safety and health outcomes for individuals with ASD and their caregivers in Malaysia.

6. Conclusion

This review highlights critical safety and health concerns for individuals with ASD, including meltdowns, sensory processing difficulties, and challenging behaviours, which pose risks to both individuals with ASD and their caregivers in Malaysia. Caregivers often rely on self-created routines and informal support due to deficiencies in formal systems, while interventions such as behavioural and community-based programs showed promise but are hindered by inconsistent implementation and limited accessibility. The lack of organized instruction and affordable, widely available early interventions further exacerbates these challenges, particularly in rural areas. To improve safety and health outcomes, there is an urgent need for inclusive, culturally tailored, and accessible support systems that address the diverse needs of individuals with ASD and their caregivers. Future efforts should focus on eliminating disparities, ensuring equitable access to resources, and strengthening public awareness and support networks.

Statement on the accessibility of data

The article/supplementary material contains the study's original contributions. Additional questions should be addressed to the corresponding author(s).

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Table 1

Selected journal articles

N o.	Author(s)	Year of Study	Title	Location	Study Population	Methods Used	Key Findings	Safety and Health Challenges	Management Strategies	Effectiveness of interventions
1	[18]	2023	Meltdown in Autism: Challenges and Support Needed for Parents of Children with Autism	Peninsular Malaysia	Parents of children with ASD	Surveys and Interviews	Identified the main challenges in managing meltdowns in public spaces, such as lack of public awareness and social stigma, impacting both the child's safety and caregiver's mental health.	Managing meltdowns in public spaces impacts caregivers' safety and mental health.	Caregivers implemented structured routines and calming techniques for children, while also seeking social support for themselves.	Structured routines and calming techniques effectively reduced the frequency and intensity of meltdowns, improving child safety and caregiver stress levels.
2	[14]	2024	Affiliate Stigma, Resilience, and Quality of Life Among Parents of Children with Autism Spectrum Disorder in Two Public Hospitals in Kelantan, Malaysia	Kelantan, Malaysia	Parents of children with ASD	Questionnaires	Found that affiliate stigma significantly lowered parental resilience, with stigma being a major factor leading to decreased quality of life among parents.	Affiliate stigma leads to reduced resilience and lower quality of life among parents.	No specific management strategies were mentioned for caregivers, the focus was on the impact of stigma.	No specific interventions were highlighted, the study focused on the impact of stigma rather than intervention outcomes.
3	[9]	2023	Problem Behaviours and Caregiver Burden Among Children with Autism Spectrum Disorder in Kuching, Sarawak	Kuching, Sarawak	Caregivers	Surveys and Observational Study	Showed that hyperactivity and aggression in children with ASD were key factors leading to higher caregiver burden, which in turn exacerbated mental health issues like	Hyperactivity and aggression in children lead to increased caregiver burden and mental health issues.	Use behavioural interventions for children, while caregivers engaged in stress-relief practices and sought mental health support.	Behavioural interventions like positive reinforcement were moderately effective in reducing challenging behaviours but

							anxiety and depression among caregivers.			required consistent application to sustain improvements in child behaviour and caregiver mental health.
4	[16]	2024	Experiences and Difficulties of Parents in Caring Their Children with Autism Living in Malaysia	Peninsular Malaysia	Parents of children with ASD	Interviews	They identified that parents faced difficulties in managing the sensory and communication challenges of their children with ASD, with a lack of support and understanding from healthcare providers being significant gaps.	Challenges in managing sensory and communication issues due to lack of support from healthcare providers.	Parents used sensory-friendly environments for children and sought counselling services for their mental health.	Sensory-friendly environments and consistent communication techniques effectively reduced sensory overload and improved interaction quality, though the impact on overall health outcomes was limited.
5	[11]	2021	Challenges and Support for Parents of Children with Autism Spectrum Disorder at Work	Peninsular Malaysia	Working parents of children with ASD	Mixed Methods (Interviews & Surveys)	It was reported that balancing work and caregiving responsibilities was a major challenge for parents, with stress factors including inflexible work environments and lack of employer support.	Stress from balancing work and caregiving responsibilities and lack of employer support exacerbate difficulties.	Some parents sought flexible work arrangements, caregiver networks, and stress management strategies.	Flexible work arrangements and colleague support were effective in reducing stress, though improvements in work-life balance depended on employer policies.

6	[10]	2023	Knowledge Attitudes, and Associated Factors of Caregivers towards Children with Autism Spectrum Disorder in East Coast Peninsular Malaysia	East Coast Peninsular Malaysia	Caregivers	Surveys	Highlighted significant gaps in caregivers' knowledge and attitudes towards ASD, particularly in understanding and managing ASD-related behaviours, which led to ineffective caregiving strategies.	No specific safety challenges were highlighted, but gaps in knowledge led to ineffective caregiving strategies.	No specific management strategies were highlighted for caregivers, knowledge gaps prevented effective caregiving.	No specific interventions were highlighted, focus was on identifying gaps in caregiver knowledge.
7	[7]	2022	The Challenges in Raising Autistic Children: The Voices of Mothers	Selangor, Malaysia	Mothers of children with ASD	Focus Groups	Revealed that mothers experienced significant emotional and financial stress, often due to inadequate social support, leading to burnout and reduced quality of caregiving.	Emotional and financial stress leads to burnout and reduced quality of caregiving.	Mothers relied on informal support networks, sought financial counselling, and engaged in self-care practices.	Informal support networks and self-care practices helped to manage stress and prevent burnout, though the long-term effectiveness was variable and dependent on the level of support available.
8	[15]	2022	The Current Practices and Challenges of a Community-Based Early Intervention Centre for ASD Children in Malaysia	Peninsular Malaysia	Caregivers and Educators	Case Studies	Found inconsistencies in early intervention practices, particularly in accessibility and standardization, which led to disparities in the effectiveness of	Inconsistencies in early intervention services lead to disparities in safety and effectiveness of care.	Standardization efforts in early intervention were made, with caregivers receiving training and support.	Standardization efforts in early intervention showed promise in improving service effectiveness, though inconsistencies in application

							services provided to children with ASD.			limited overall impact.
9	[8]	2021	Quality of Life and Child's Autism-Specific Difficulties among Malaysian Main Caregivers: A Cross-Sectional Study	Peninsular Malaysia	Main caregivers of children with ASD	Cross-Sectional Study	Identified a strong correlation between the quality of life of caregivers and the severity of ASD-specific difficulties, with caregivers of children with more severe symptoms experiencing greater challenges and lower quality of life.	Caregivers of children with severe ASD symptoms face greater challenges, impacting their quality of life.	Caregivers participated in support groups and received professional counselling to cope with stress.	Support groups and professional counselling were effective in helping caregivers manage stress, particularly for those dealing with severe ASD symptoms in their children.
10	[12]	2023	Emotional States and Quality of Life among Parents of Children with Autism Spectrum Disorder (ASD) during COVID-19 in Malaysia	Peninsular Malaysia	Parents of children with ASD	Questionnaires	Showed that the emotional states of parents, particularly stress and anxiety, were closely linked to their quality of life during the COVID-19 pandemic, with significant impacts on their mental health.	Stress and anxiety during the COVID-19 pandemic lockdown significantly affected parents' mental health.	Caregivers practiced mindfulness, used stress management techniques, and sought temporary respite care.	Stress management techniques like mindfulness were effective in improving mental health outcomes during the pandemic, though the need for more formalized support was noted.
11	[6]	2023	Factors Influencing Despair, Self-blame, and Acceptance Among Parents of Children with	East Coast Peninsular Malaysia	Parents of children with ASD	Mixed Methods (Surveys and Interviews)	Identified several factors contributing to despair and self-blame among parents, including financial strain, lack of social support,	Financial strain, lack of social support, and severity of the child's condition contribute to despair and self-	Caregivers engaged in community support groups, practiced acceptance and reframing, and	Community support groups and professional mental health services were effective in reducing despair

			Autism Spectrum Disorder (ASD): A Malaysian Perspective				and the severity of the child's ASD.... Community support played a critical role in helping parents achieve greater acceptance and improve their mental health and coping mechanisms.	blame among parents.	sought professional mental health support.	and improving acceptance among parents, though outcomes varied depending on the severity of the child's condition.
12	[17]	2021	Behind the Scenes of Parents Nurturing a Child with Autism: A Qualitative Study in Malaysia	Peninsular Malaysia	Parents of children with ASD	Qualitative Study	Documented the unique challenges faced by parents, including navigating the healthcare system, managing daily routines, and dealing with social stigma, which emphasized the need for more comprehensive support.	Navigating the healthcare system, managing daily routines, and dealing with social stigma present ongoing challenges.	Caregivers sought professional advice, created structured routines, and advocated for the child's needs while seeking peer support for themselves.	Professional advice and structured routines effectively managed daily challenges, but the overall impact on long-term health outcomes was unclear due to the complexity of needs.
13	[13]	2022	Quality of Life Among Mothers of High Functioning Autism Spectrum Disorder (HFASD) Adolescents	Selangor & Perak, Malaysia	Mothers of adolescents with HFASD	Questionnaires	Explored the quality of life among mothers of HFASD adolescents, highlighting ongoing challenges such as social isolation and lack of tailored support services despite their children's high functioning.	No specific safety challenges were highlighted, but ongoing challenges related to social isolation and lack of tailored support services for mothers.	No specific management strategies highlighted; ongoing challenges due to lack of tailored support services.	No specific interventions were highlighted, and the focus was on the challenges due to the lack of tailored support services.

Table 2

Quality assessment results against the effective public health practice project quality assessment tool

No.	Author(s)	Selection Bias	Study Design	Confounders	Blinding	Data Collection	Withdrawals/Drop outs
1	[18]	Strong	Moderate	Moderate	Weak	Strong	Strong
2	[14]	Moderate	Strong	Moderate	Weak	Strong	Moderate
3	[9]	Strong	Moderate	Strong	Weak	Moderate	Moderate
4	[16]	Moderate	Moderate	Moderate	Weak	Strong	Moderate
5	[11]	Strong	Strong	Weak	Weak	Moderate	Moderate
6	[10]	Weak	Weak	Weak	Weak	Moderate	Weak
7	[7]	Moderate	Moderate	Strong	Weak	Strong	Moderate
8	[15]	Strong	Moderate	Moderate	Moderate	Strong	Strong
9	[8]	Moderate	Moderate	Strong	Weak	Moderate	Moderate
10	[12]	Moderate	Strong	Moderate	Weak	Strong	Moderate
11	[6]	Strong	Moderate	Moderate	Moderate	Moderate	Strong
12	[17]	Moderate	Moderate	Strong	Weak	Strong	Moderate
13	[13]	Weak	Moderate	Weak	Weak	Moderate	Weak